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Kokawa et al.

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(54) **PORTABLE PRINTER WITH ASYMMETRICALLY-DAMPED MEDIA CENTERING**

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(51) **Int. Cl.**
B41J 3/36 (2006.01)

(52) **U.S. Cl.**
USPC **400/88**; 400/613; 400/583

(58) **Field of Classification Search**
USPC 400/88, 633, 642, 611, 613, 583, 400/205.1, 120.16, 120.17; 271/171; 242/596, 242/596.2, 596.4, 596.5, 596.1, 598.1
See application file for complete search history.

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Primary Examiner — Matthew G Marini
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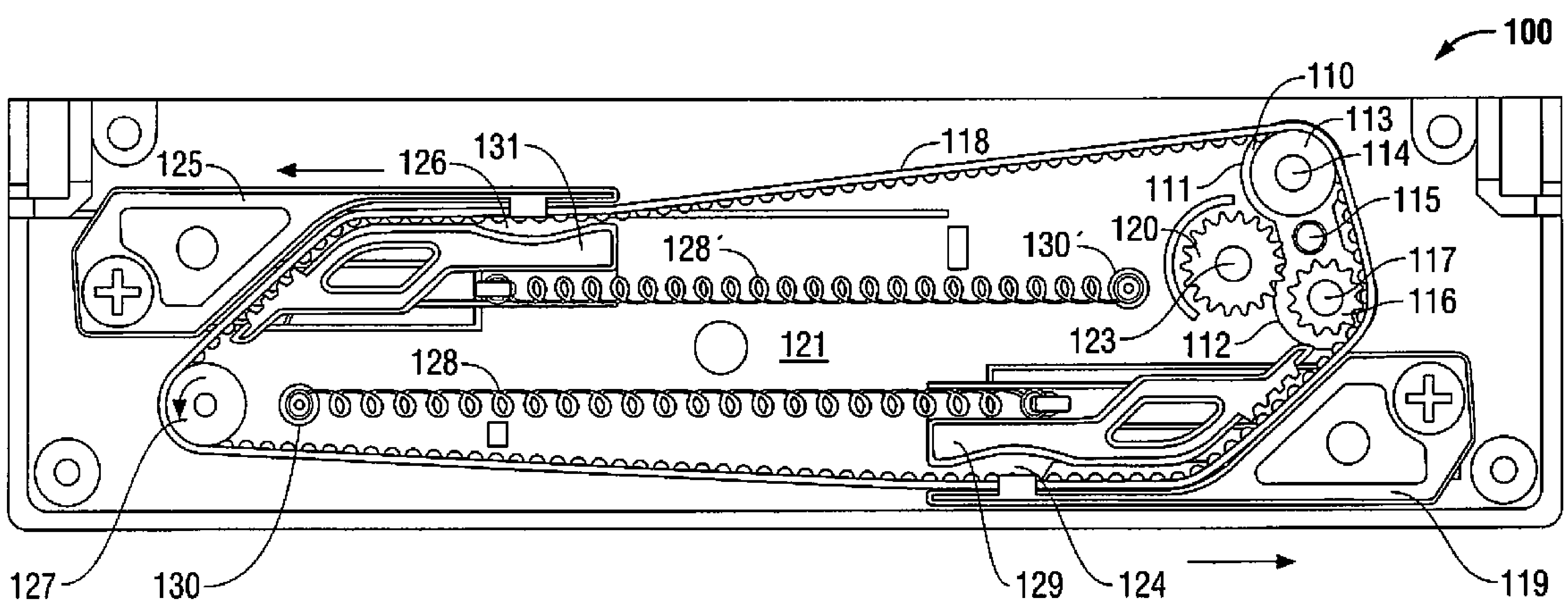
(57) **ABSTRACT**

A portable printer having improved ergonomic and operational characteristics. The printer includes an asymmetrically-damped media centering mechanism having first and second media support members moveable along a common longitudinal axis and configured to grasp roll media. The media support members are coupled to a reciprocal movement mechanism configured to translate a longitudinal movement of the first media support member into a corresponding opposite longitudinal movement of the second media support member. A pivoting arm is coupled to the reciprocal movement mechanism. The pivoting arm pivots to a first position when the first and second media support members are moved closer to each other, which causes a damping gear to engage the reciprocal movement mechanism, thereby damping the grasping motion of the media support members and providing an improved user experience. The printer facilitates one-handed operation, including one-handed loading and unloading of media, enabling its use in a variety of environments.

14 Claims, 13 Drawing Sheets



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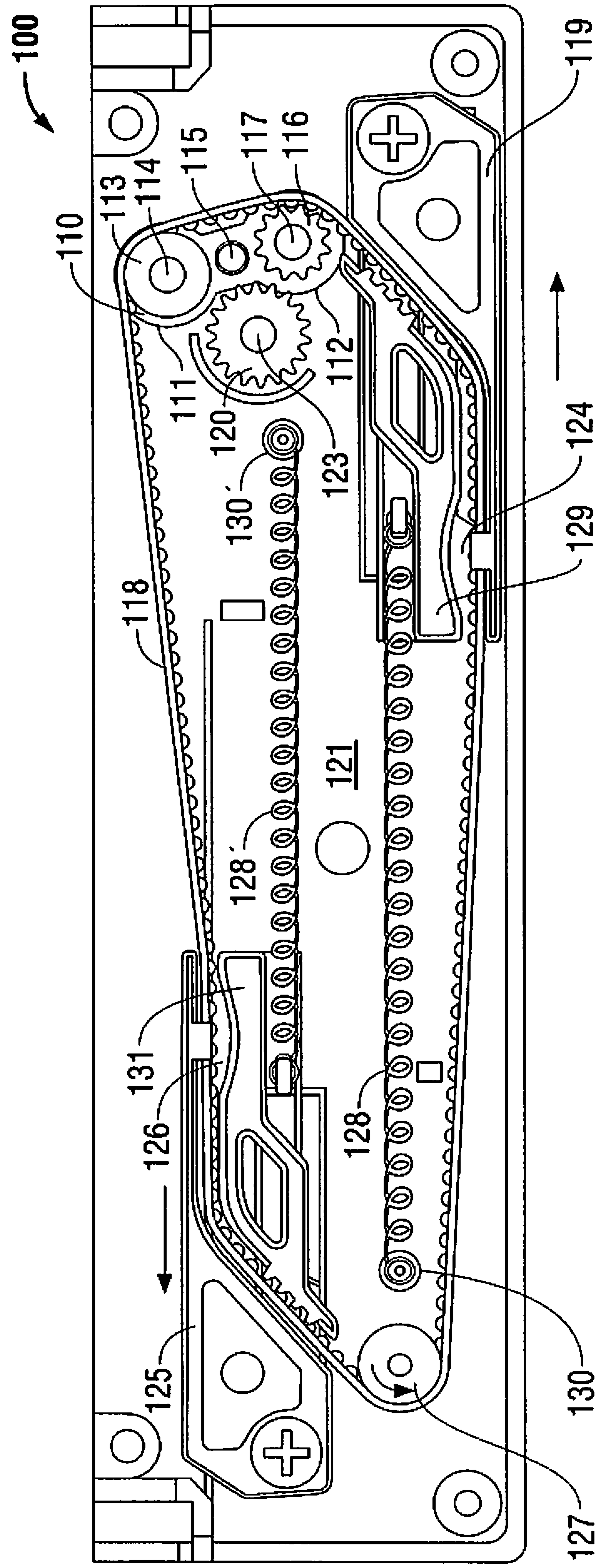
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FIG. 1

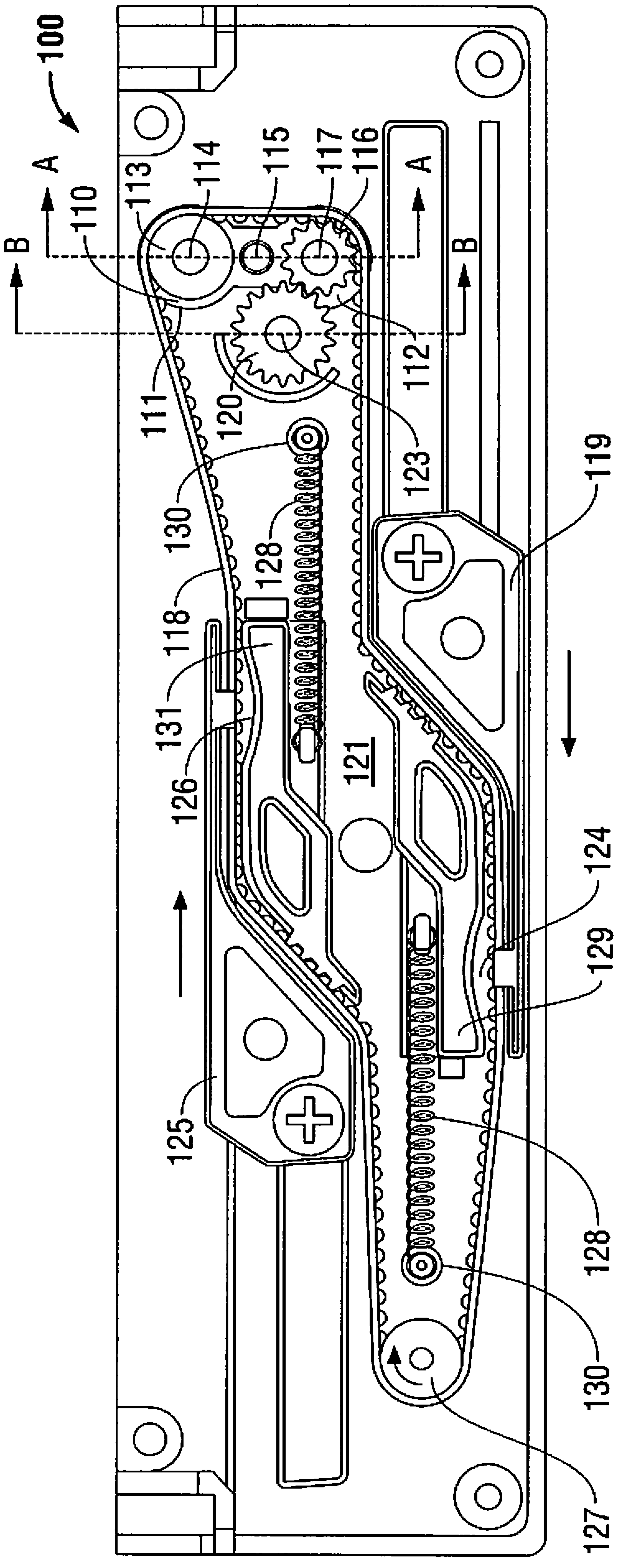
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FIG. 2

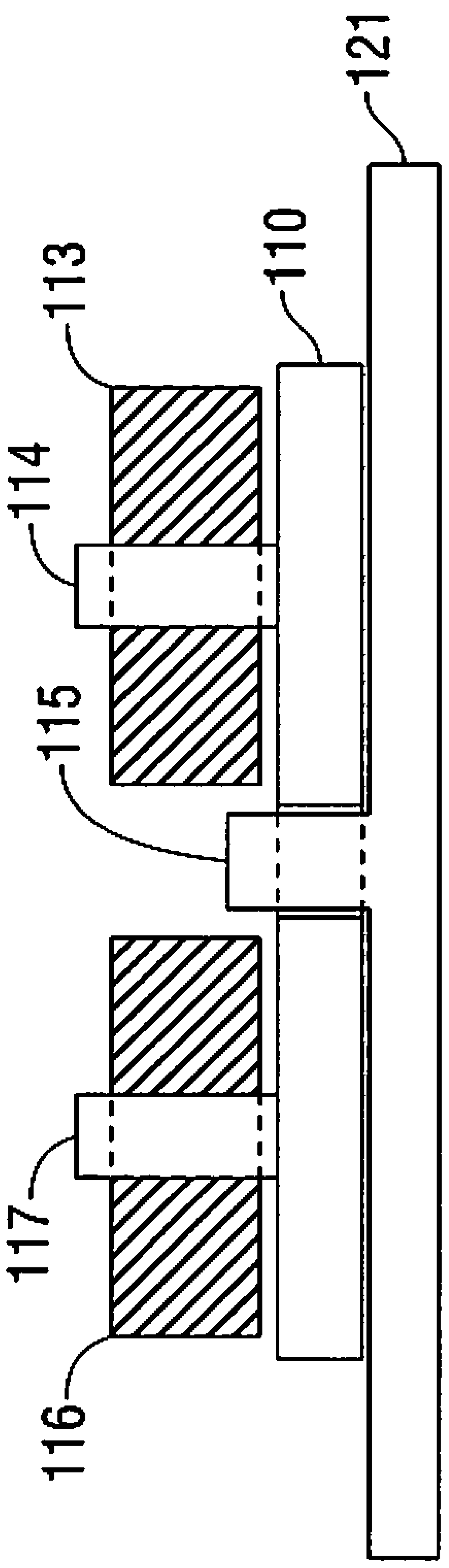

FIG. 3
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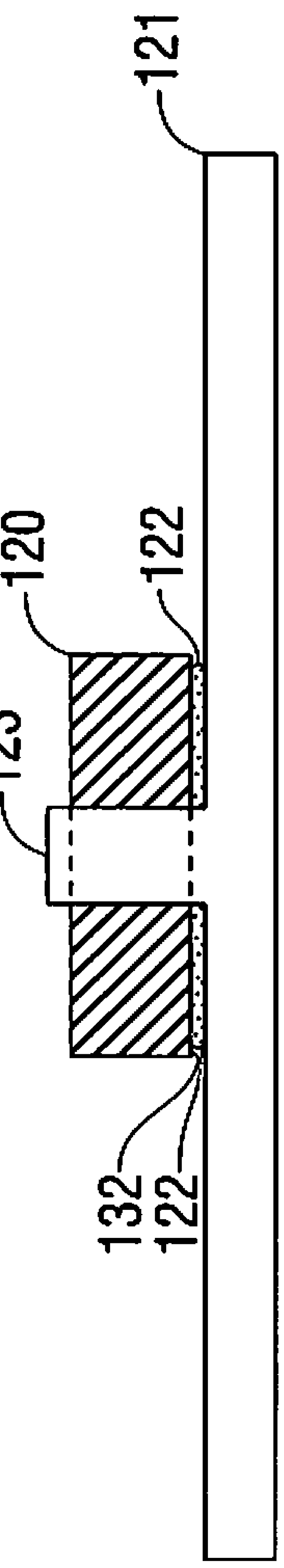

FIG. 4
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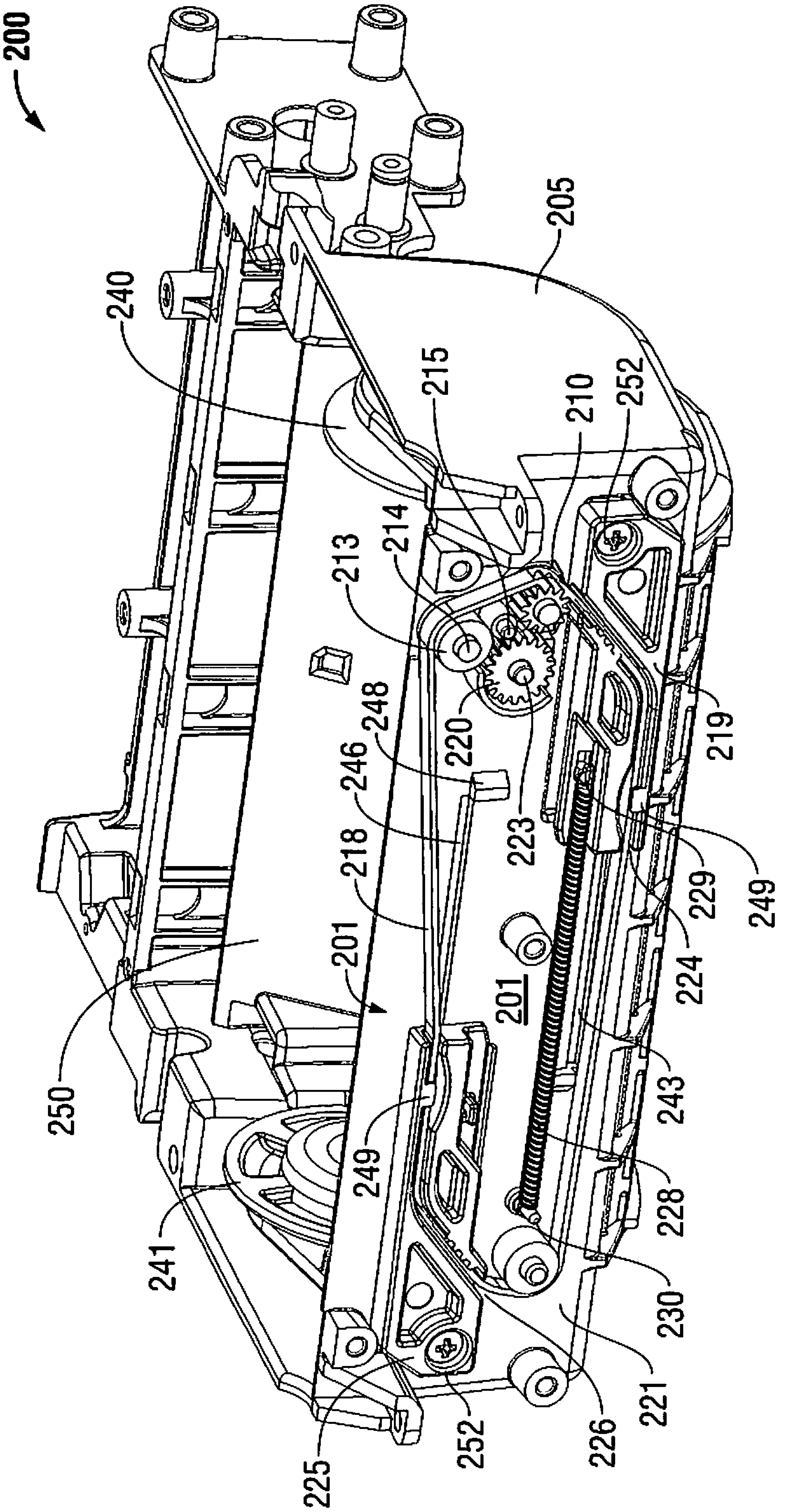
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FIG. 5

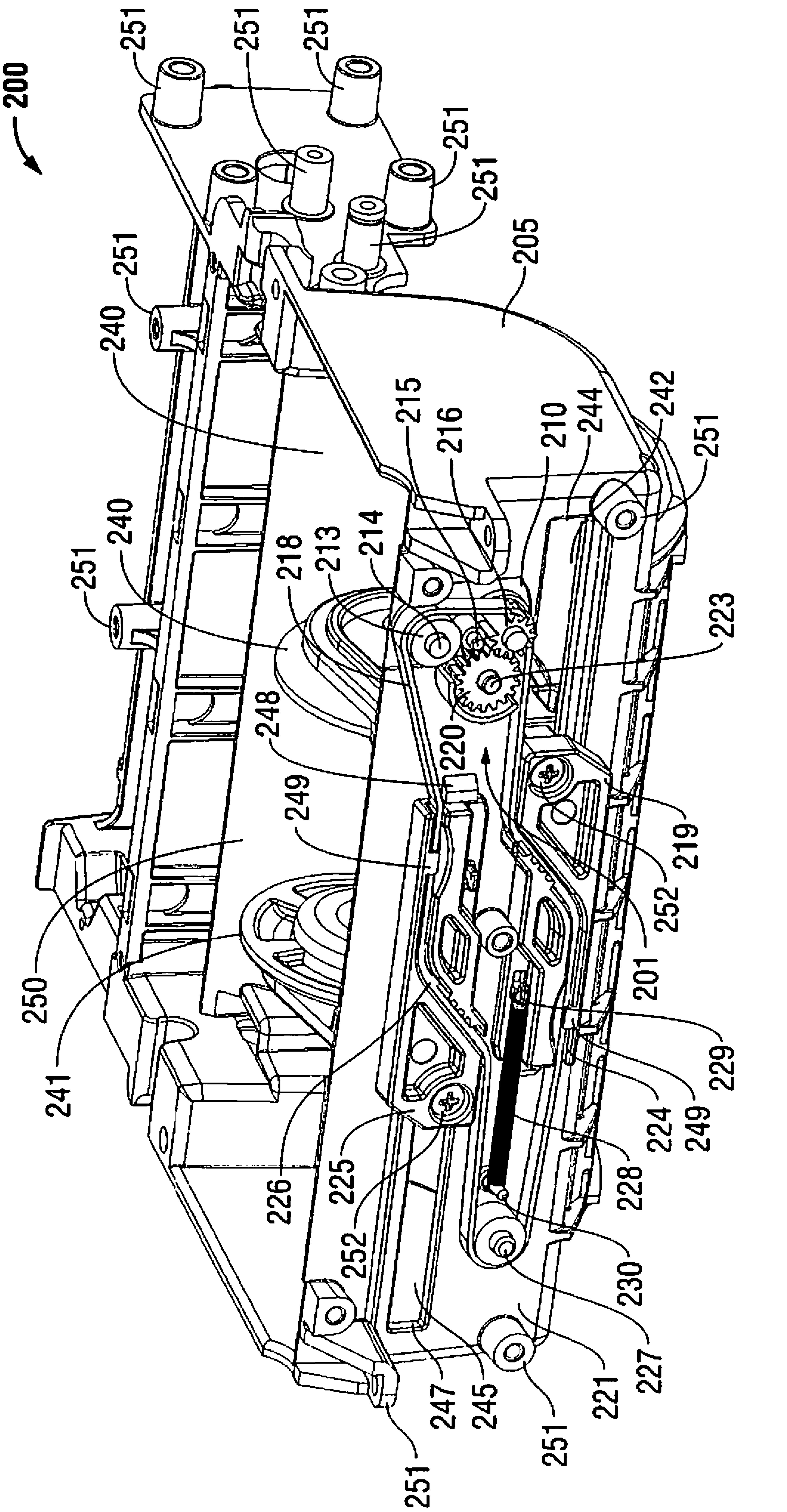
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FIG. 6

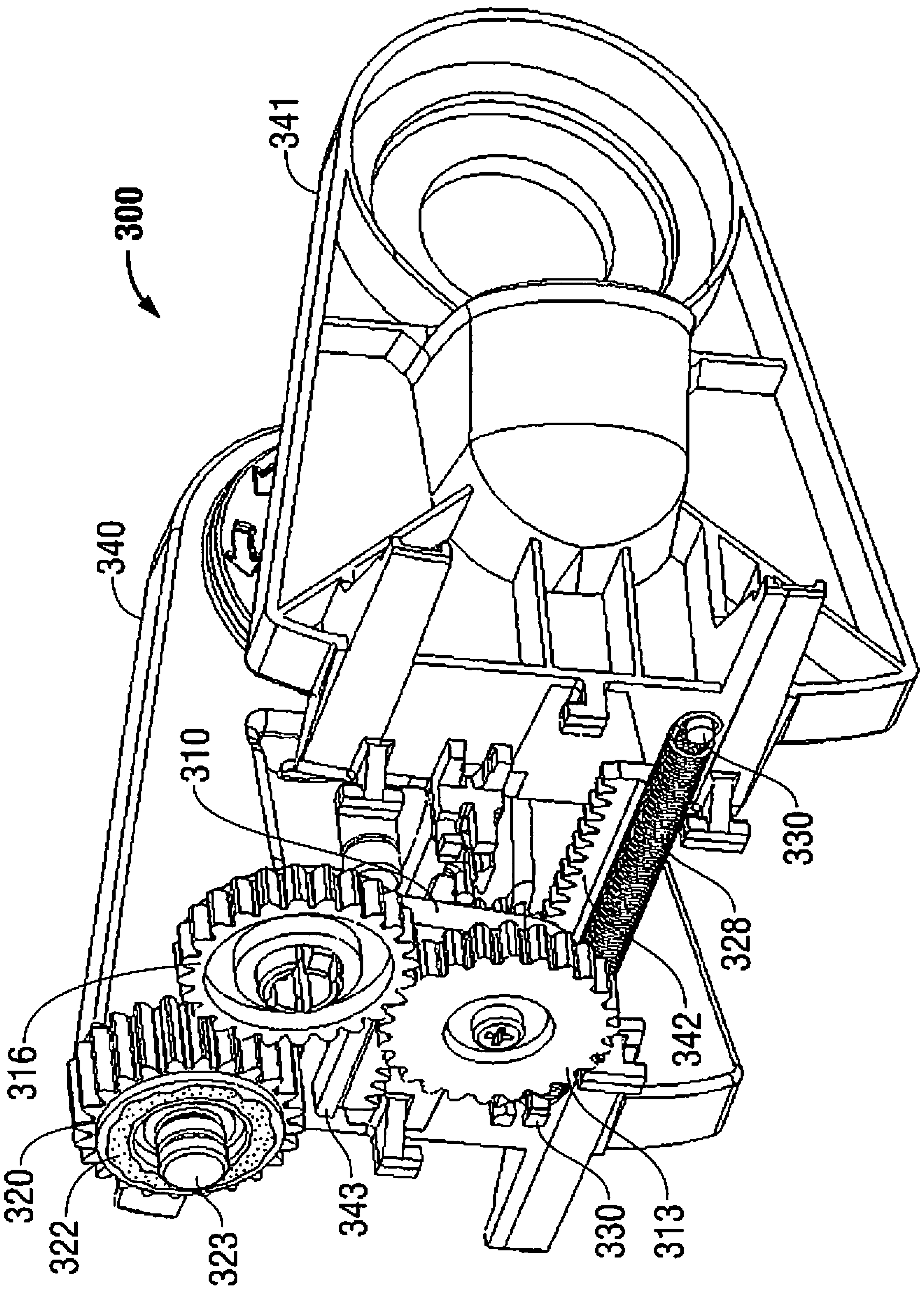

FIG. 7

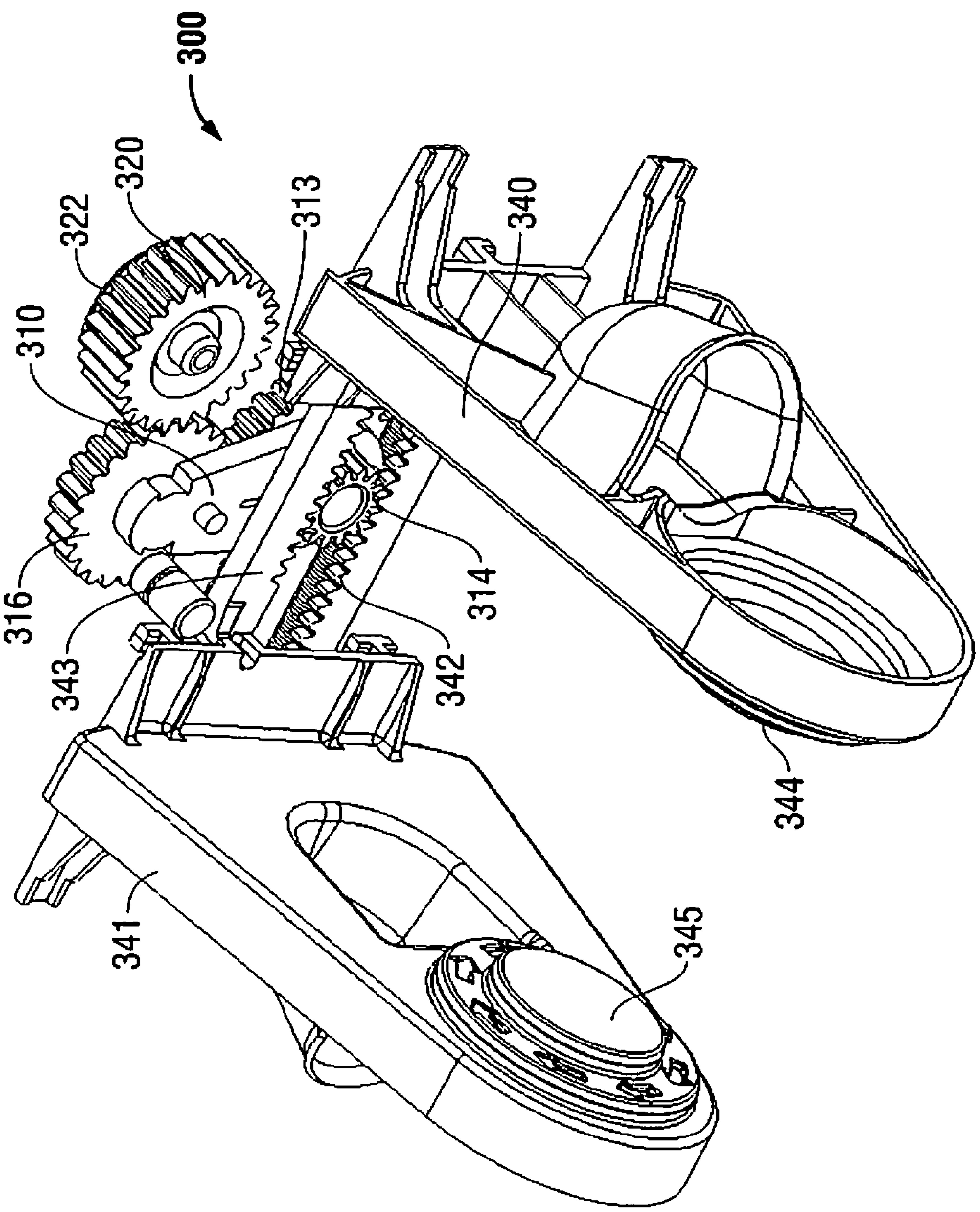

FIG. 8

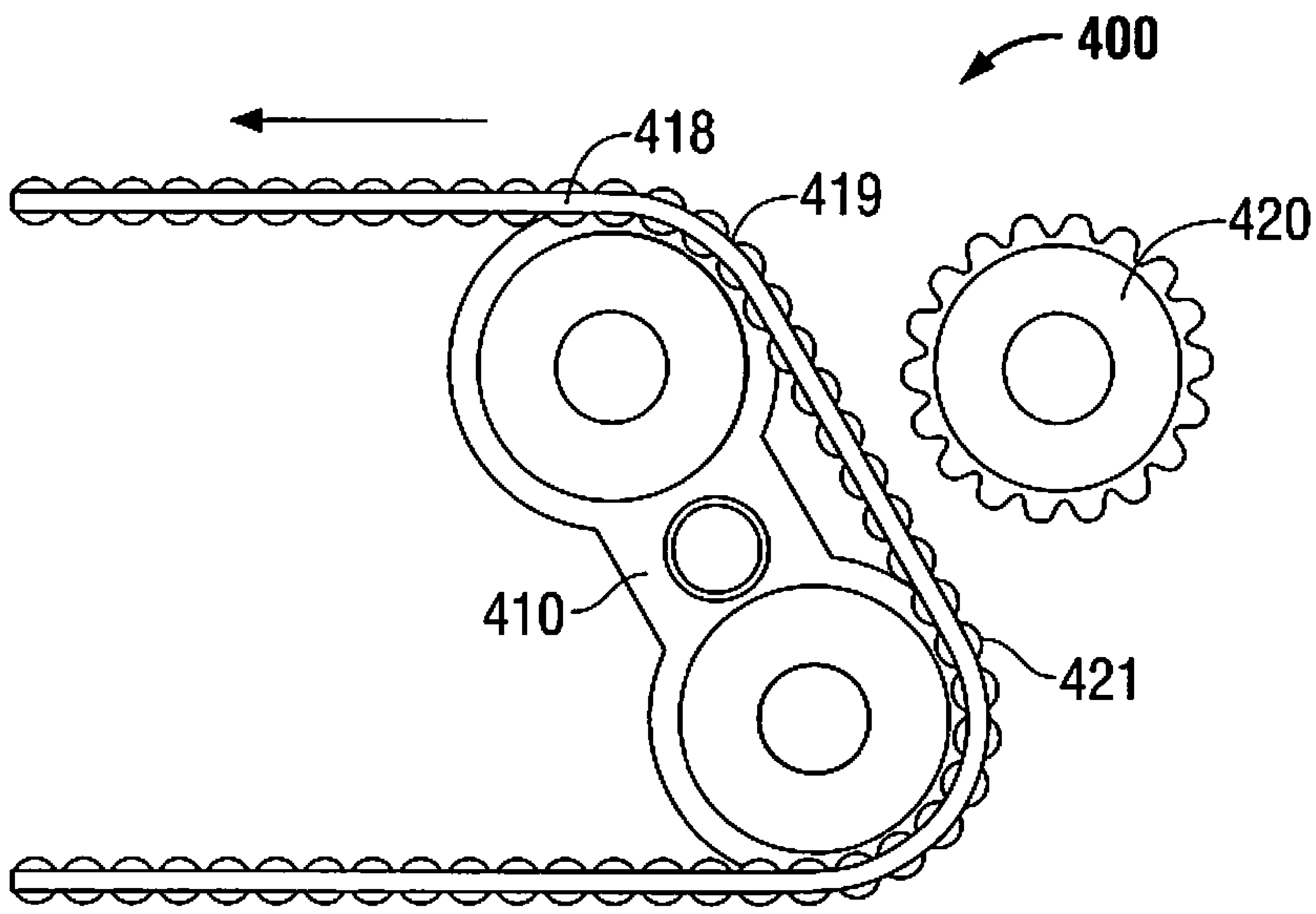

FIG. 9

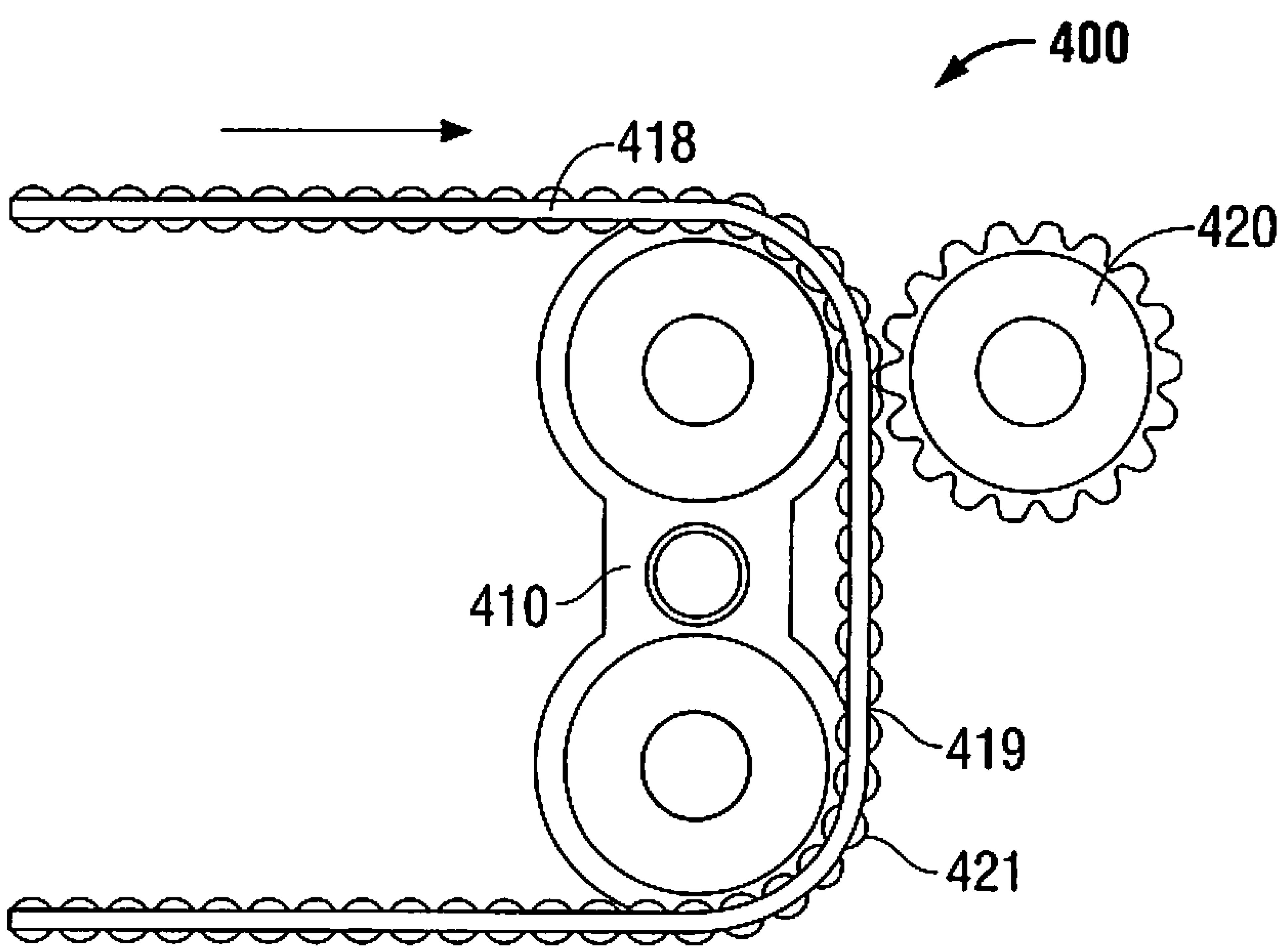

FIG. 10

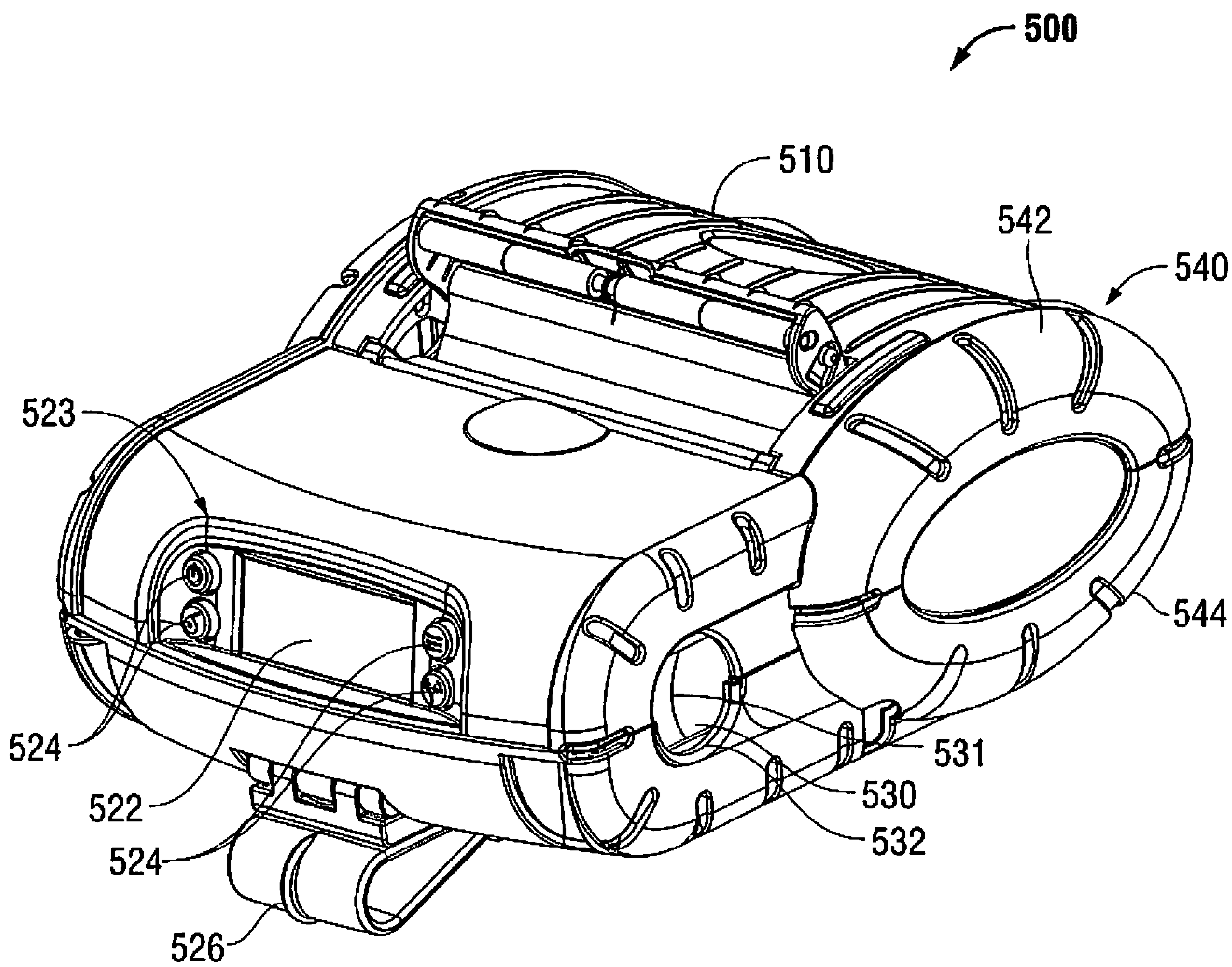

FIG. 11

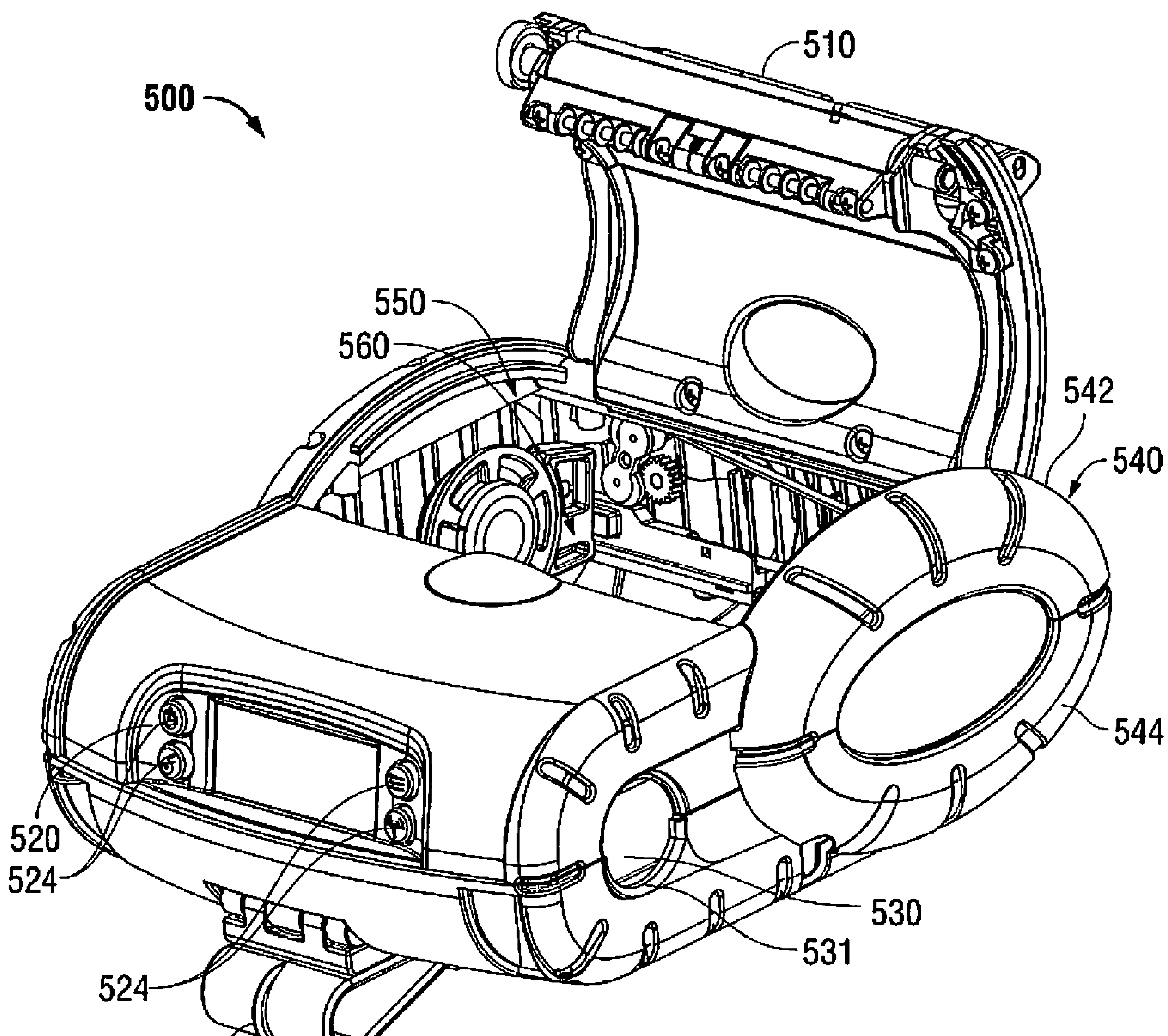

FIG. 12

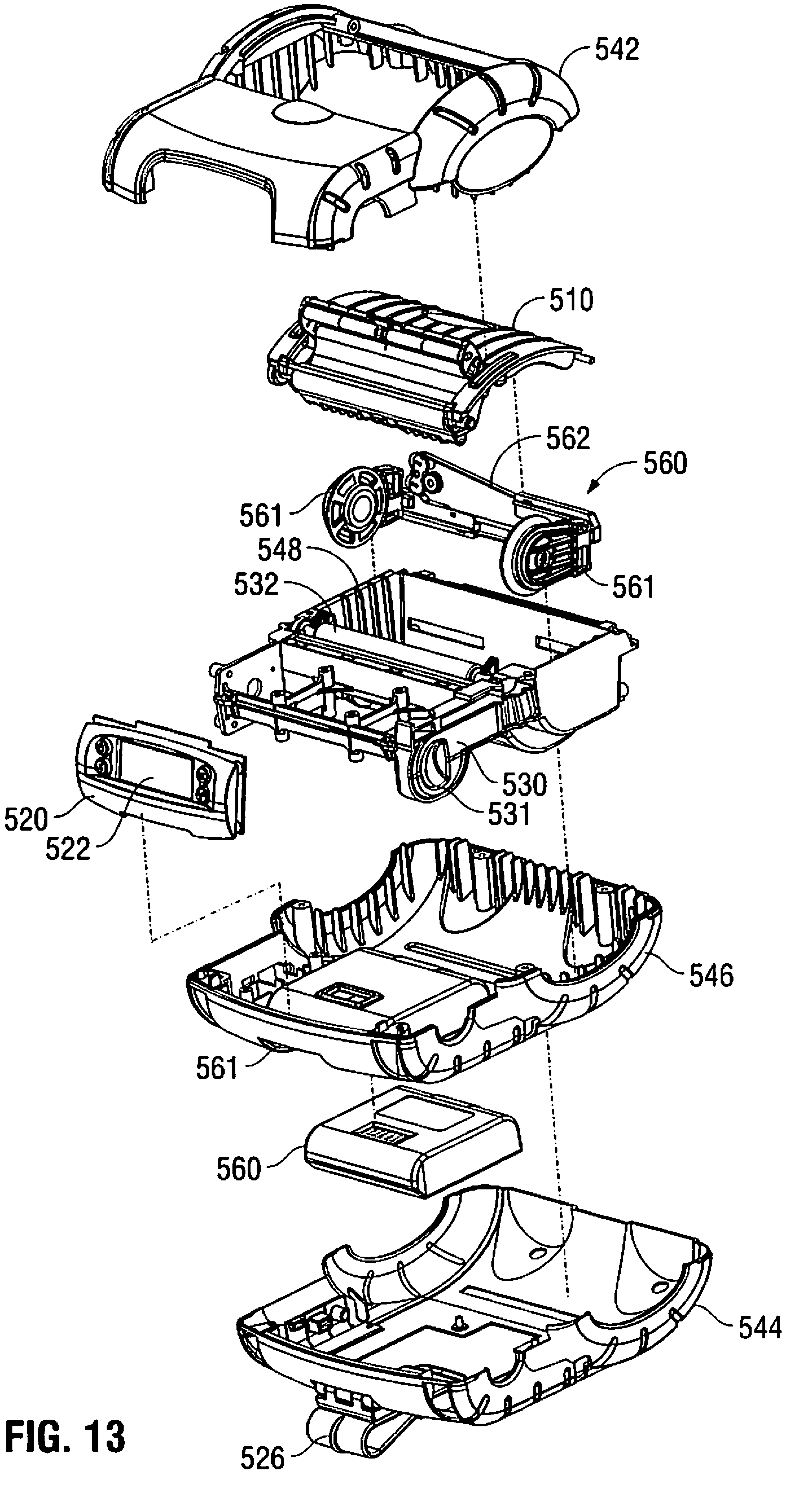
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FIG. 13

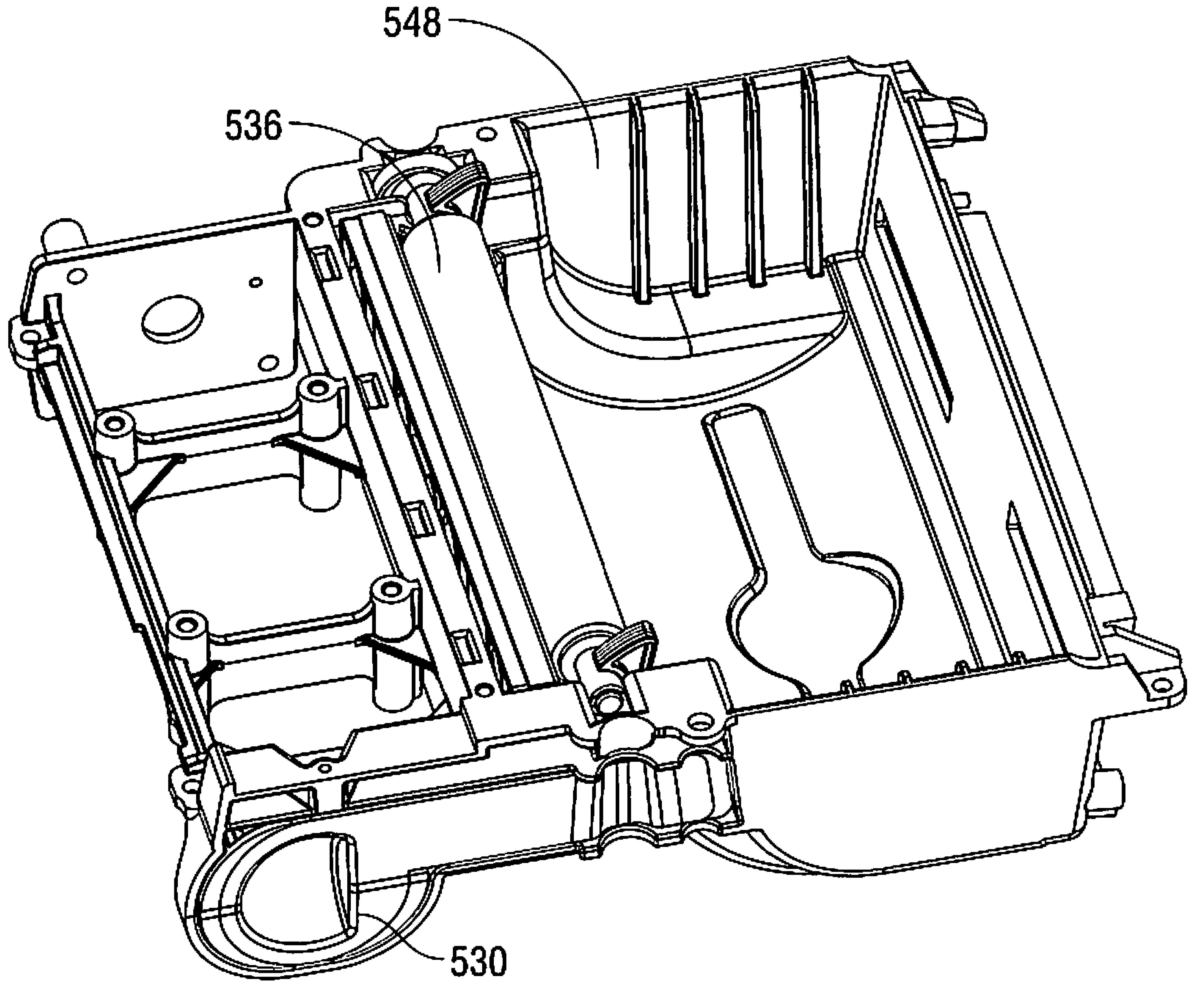

FIG. 14

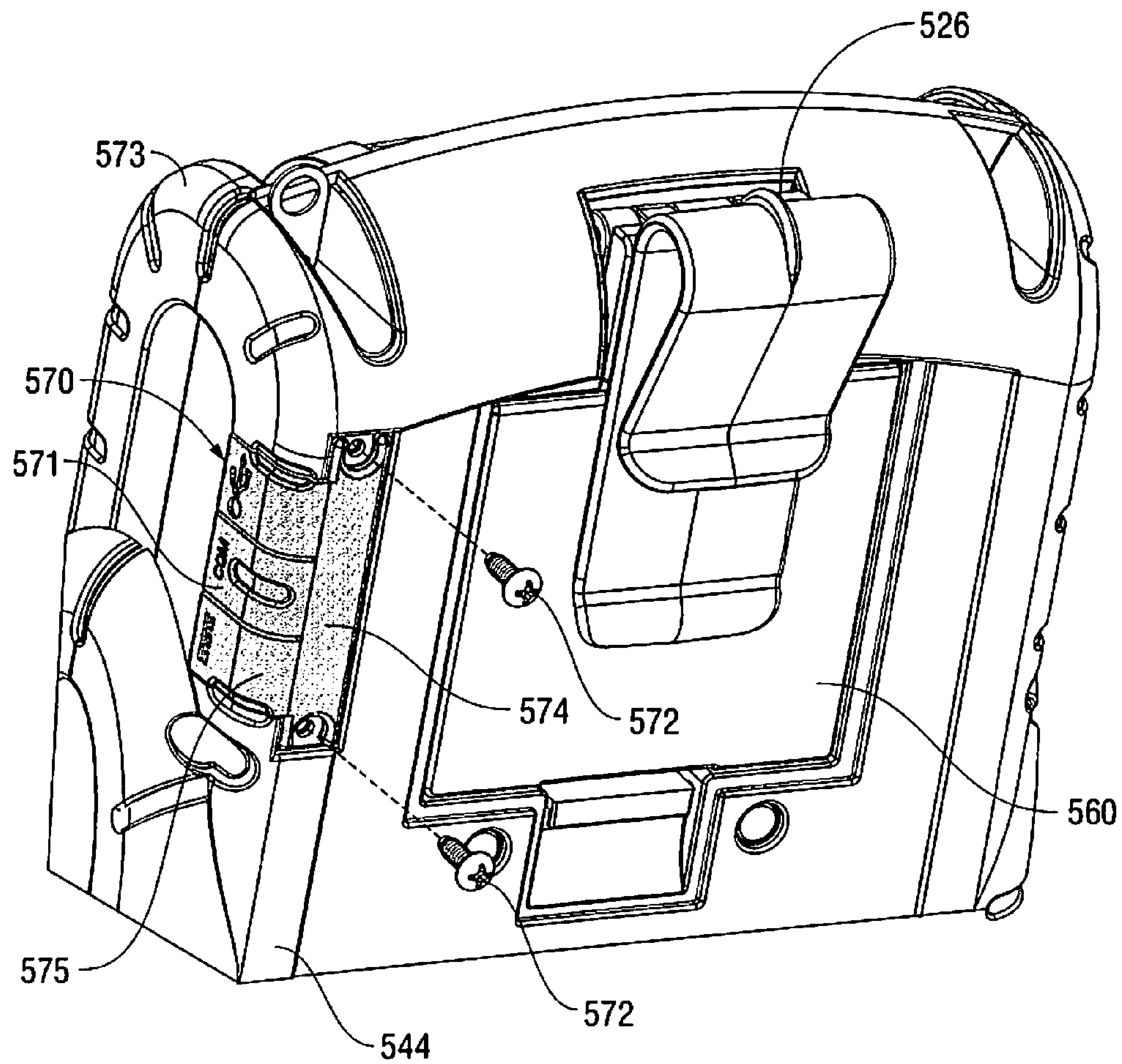

FIG. 15

PORTABLE PRINTER WITH ASYMMETRICALLY-DAMPED MEDIA CENTERING

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority from, and the benefit of, U.S. Provisional Application Ser. No. 61/304,964, filed Feb. 16, 2010, the entirety of which is hereby incorporated by reference herein for all purposes.

BACKGROUND

The present disclosure relates to continuous feed printers, and more particularly, to a portable label or thermal printer having a selectively adjustable, asymmetrically damped media centering assembly.

Portable or desktop printers are often used in commercial settings, e.g., in warehouses, in industrial and manufacturing environments, by shipping services, in vending machine routes, in the vending and gaming industries, and in retail establishments for ticket printing and inventory control. Ideally, portable printers weigh only a few pounds and are small enough to be easily carried during use and/or easily attached to a buckle or a harness-type device. This enables the user to print labels or receipts on demand without having to retrieve a printed label from a printing station. Because the printer is portable, the printer may include a power source, such as a disposable or rechargeable battery, and may additionally communicate with a host terminal or network connection via a wireless interface, such as a radio or optical interface. A portable printer may utilize sheet-fed media, or, more popularly, continuous-feed media, e.g., rolls of paper, labels, tags, and the like. Portable printers commonly employ direct thermal transfer techniques, whereby thermochromic media passes over a thermal print head which selectively heats areas of the media to create a visible image. Also popular are thermal transfer printers which employ a heat-sensitive ribbon to transfer images to media.

A continuous feed printer is particularly suitable for printing onto stock material which may include, but is not necessarily limited to, labels, receipts, item labels, shelf labels/tags, ticket stubs, stickers, hang tags, price stickers, and the like. Label printers may incorporate a media supply of "peel away" labels adhered to a coated substrate wound in a rolled configuration. Alternatively, a media supply may include a plain paper roll suitable for ink-based or toner-based printing. Continuous media is typically supplied in rolls, and is available in a wide range of widths. The roll media may be wound around a generally tubular core which supports the roll media. The core may have a standard size, or arbitrarily-sized inner diameter. In use, the media is drawn against a printing head, which, in turn, causes images to be created on the media stock by, e.g., impact printing (dot matrix, belt printing), by localized heating (thermal transfer printing), inkjet printing, toner-based printing, or other suitable printing methods.

Portable or thermal printers may be designed for use with one type of printing media or one particular size of print media, e.g., 2-inch label stock or 3-inch label stock. Other portable printers may be configurable to accommodate different media types and sizes. Such printers may include a media centering mechanism which is designed to accommodate roll media of varying widths and/or core diameters. The media centering mechanism may include opposing support members configured to engage the media roll core. A media centering mechanism typically includes first and second support members that are generally biased towards each other to secure the media roll. Movement of the first and second support members may be synchronized by one or more gears or belts such that, when a support member is moved a distance from the centerline of the media roll, the other support member moves a corresponding distance in the opposing direction from the centerline of the media roll.

Many of the media centering mechanisms associated with portable printers are not particularly versatile or convenient to use, and may employ various spring-loaded elements that are intended to accommodate media of various types and sizes. As a result, even though certain portable printers may accommodate media of various sizes, to load such media a user must manipulate the spring-loaded members and other mechanical elements using both hands. Such spring-loaded elements can suddenly snap into position with considerable force, which may result in an unpleasant user experience, damage to the print media, and even damage to the printer itself.

SUMMARY

The present disclosure is directed to a portable printer having an asymmetrically-damped media centering mechanism. The mechanism allows a user to open the spring-loaded media support members with ease, but, upon release, damping is provided to the media support members to cause the retraction thereof to occur at slower, controlled rate. In this manner, the disclosed media centering mechanism may facilitate easier media loading (including one-handed loading), may provide an improved user experience, and may prevent damage to the print media and/or to the printer.

The dampening mechanism includes a damping gear, and a pivoting arm having at least one idler gear wherein the pivoting arm pivots between at least a first, non-damped position and a second, damped position in response to movement of a media support member. The damping gear includes a rotational resistance element, such as, without limitation, damping grease, a frictional mechanism, a regenerative braking mechanism, a magnetic braking mechanism, a centrifugal governor, and combinations thereof and/or of other suitable rotational resistance elements now or in the future known. The idler gear cooperates with one or more drive elements associated with the media support member, such as without limitation, a rack and pinion drive and/or a belt drive. The pivot arm is arranged such that, when a media support member is moved toward an open position, the drive element causes the pivot arm to move into the non-damped position wherein the idler gear on the pivot arm is disengaged from the damping gear, thus allowing free movement of the media support member. When the media support member moves toward the closed position, the pivot arm moves into the damped position wherein the idler gear on the pivot arm engages the damping gear, which in turn slows the motion of the drive element and media support member. In this manner, asymmetrical damping is achieved whereby the media support members open freely against only the spring force, but retract slowly with the dampening effect as the idler gear engages the dampening gear.

An asymmetrically-damped media centering mechanism is disclosed which includes a first media support member moveable along a longitudinal axis thereof and a second media support member moveable along a longitudinal axis thereof. The first and second media support members may share a common longitudinal axis of movement. The disclosed media centering mechanism includes a reciprocal movement mechanism operably coupled to the first and second media support members that is configured to translate a longitudinal movement of the first media support member into a corresponding opposite longitudinal movement of the second media support member. The media centering mechanism further includes a pivoting arm coupled to the reciprocal movement mechanism. The pivoting arm is pivotable between at least a first and a second position. During use, the pivoting arm pivots to the first position when the first and second media support members are moved closer to each other (e.g., when grasping or closing onto a media roll positioned therebetween), and the pivoting arm pivots to the second position when the first and second media support members are moved further apart from each other (e.g., when spreading the media support members to insert a media roll therebetween). A damping gear is provided that is configured to engage the reciprocal movement mechanism when the pivoting arm is in the first position. The reciprocal movement mechanism may include a first and second drive member operably coupled to the first and second media support members, respectively, and may include a drive belt operably coupled to the first and second drive members and at least partially disposed around the driven gear. Additionally or alternatively, the reciprocal movement mechanism may include a first and second rack member operably coupled to the first and second media support members, respectively, wherein a pinion gear is operably engageable with the first and second rack members and configured to translate movement of the first rack member into a corresponding opposite movement of the second rack member. In embodiments, the pinion gear is axially coupled to the driven gear.

Also disclosed is a method of centering a media roll, comprising the steps of providing a first and a second media support member moveable along a longitudinal axis and dimensioned to axially engage a media roll. The method includes the step of providing a reciprocal movement mechanism operably coupled to the first and second media support members wherein a longitudinal movement of one media support member causes a corresponding opposite longitudinal movement of the other media support member. A pivoting arm is provided, which operably couples to the reciprocal movement mechanism, wherein the pivoting arm pivots to the first position when the media support members arc moved closer to each other, and the pivoting arm pivots to the second position when the media support members are moved further apart from each other. A damping gear is provided which is configured to engage the reciprocal movement mechanism when the pivoting arm is in the first position.

Also disclosed is a portable printer that includes a display having an overmolded bezel associated therewith. The overmolded bezel is formed from resilient material that provides shock resistance and which protects the display, printer, and associated components thereof from damage in the event the portable printer is dropped or otherwise mishandled. In embodiments, the overmolded bezel is formed from Versollan™ OM 1255NX-9, a thermoplastic elastomer manufactured by PolyOne Corporation of Avon Lake, Ohio, USA. The overmolded bezel additionally or alternatively seals the display and printer to resist the infiltration of contaminants, e.g., dust and moisture, into the display and/or printer.

Disclosed is a portable printer having ergonomic enhancements. In embodiments, a printer in accordance with the present disclosure includes a media loading arrangement capable of single-handed operation. A media cover may be unlatched using a lever operable by a single hand. Using a single hand, the media cover may be fully unlatched, e.g., both sides freed from an associated housing, such that the media cover swings clear of the housing to expose a media storage well. Media may be loaded into the media storage well and the media cover closed with one hand. Single-handed operation may provide a number of benefits. In one envisioned scenario, the portable printer may be hung from the waistbelt of a user, e.g., a warehouse worker. Such a worker is often situated precariously, such as on a forklift, on an elevated platform of a Hi-Lo machine, and the like, wherein using two hands to manipulate a portable device may be hazardous. By facilitating one-handed operation, a portable printer in accordance with the present disclosure may offer safer, more convenient, and more reliable operation.

In another aspect, a portable printer in accordance with the present disclosure includes a dual wall, frame housing that provides improved strength and shock resistance. The dual wall construction includes a continuous inner frame structure adapted to support one or more internal printer components, which may include, without limitation, a printhead, a roller assembly, a drive assembly, media centering assembly, and/or a battery assembly. The inner frame is surrounded at least in part by a second, outer structure that provides additional stiffness, strength, and drop resistance. The housing includes a media access opening and a corresponding media access cover configured to facilitate the loading of media into the printer. The size of the media access opening is kept to the minimum size necessary to accommodate the media for use with the printer. By minimizing the media opening, greater space is available for the inner frame and/or the outer structure, further improving the strength, rigidity, and impact resistance of the printer.

The disclosed printer may include one or more connectors that extend from the interior of housing to the exterior. While the connector(s) may include an electrical connector, other connector types are contemplated within the scope of the present disclosure, e.g., moisture-proof connectors, fluidic connectors, security connectors (e.g., K-Slot), and the like. In embodiments, two electrical connectors are provided, wherein a first connector is adapted to couple a source of electrical power to the printer and a second connector is adapted to couple a data signal to the printer. In embodiments, the disclosed printer may include a USB connector, a serial (e.g., RS-232, RS-422, RS-485), connector, a Firewire (IEEE-1394) connector, a network (10Base-T, 100Base-TX, and 1000Base-T) connector, and/or a parallel (IEEE 1284) connector. The disclosed printer may additionally or alternatively include a dust cover assembly that is adapted to cover one or more connectors. The dust cover assembly includes a cap portion that is dimensioned to seal the one or more connectors associated with the dust cover. In embodiments, the dust cover is formed from resilient material. The cover is joined to a base by a resilient hinge or tethering member that retains the cap portion to the base. The cap, hinge member, and base may be integrally formed. The hinge member may be a living hinge. The base is retained to the printer by any suitable manner of fastening, including without limitation, threaded fasteners, clips, tabs, and the like. Advantageously, the dust cover assembly may be user-replaceable, so that a worn or broken dust cover assembly may be readily replaced with a new dust cover assembly. In embodiments, a spare dust cover assembly may be stored within a recess provided by the printer housing.

A portable printer having a media feed cover assembly is disclosed. In certain applications, it may be desirable to feed media into the printer from an external media source. To facilitate external media feeding, the disclosed printer includes a media feed opening defined in the housing. A media feed cover is provided to seal the media feed opening from moisture, dust, and other contaminants. The media feed cover is supported by a pocket formed between the outer enclosure and the inner frame. The cover assembly is configured to provide two or more detents to enable the cover to be positioned in an open and a closed position. In an embodiment, the pocket includes a recess in the open and closed position that provides detents for each of the open and closed positions.

Also disclosed is a portable printer that includes an upper inner frame structurally associated with a lower inner frame to form an inner support structure. An asymmetrically-damped media centering assembly is fixed to the inner support structure. An upper housing and a lower housing are joined to the inner support structure to form a dual-wall housing assembly. A media opening defined in the upper housing exposing a media well, and a media access door having at least a closed position and an open position is operatively associated with the media opening. A latch assembly having a first, normally latched position and a second, unlatched position, the latch assembly is associated with the inner support structure and is configured to retain the media access door in the closed position when the latch is in the latched position, and to release the media access door when the latch is in the unlatched position.

BRIEF DESCRIPTION OF THE DRAWINGS

Various embodiments of the subject instrument are described herein with reference to the drawings wherein:

FIG. **1** is a view of an embodiment of an asymmetrical damping mechanism in accordance with the present disclosure shown in a first, non-damped position;

FIG. **2** is a view of the FIG. **1** embodiment of an asymmetrical damping mechanism in accordance with the present disclosure shown in a second, damped position;

FIG. **3** is a cross-sectional view of a pivot arm of the FIG. **1** embodiment of an asymmetrical damping mechanism in accordance with the present disclosure;

FIG. **4** is a cross-sectional view of a damping gear of the FIG. **1** embodiment of an asymmetrical damping mechanism in accordance with the present disclosure;

FIG. **5** is a perspective view of another embodiment of an asymmetrical damping mechanism in accordance with the present disclosure shown in a first, non-damped position;

FIG. **6** is a perspective view of the FIG. **5** embodiment of an asymmetrical damping mechanism in accordance with the present disclosure shown in a second, damped position;

FIG. **7** is a perspective view of yet another embodiment of an asymmetrical damping mechanism in accordance with the present disclosure shown in a first, non-damped position;

FIG. **8** is a perspective view of the FIG. **7** embodiment of an asymmetrical damping mechanism in accordance with the present disclosure shown in a second, damped position;

FIG. **9** is a view of still another embodiment of an asymmetrical damping mechanism in accordance with the present disclosure shown in a first, non-damped position;

FIG. **10** is a view of the FIG. **9** embodiment of an asymmetrical damping mechanism in accordance with the present disclosure shown in a second, damped position;

FIG. **11** is a perspective view of an embodiment of a portable printer in accordance with the present disclosure;

FIG. **12** is another perspective view of the FIG. **11** embodiment of a portable printer in accordance with the present disclosure;

FIG. **13** is an exploded view of the FIG. **11** embodiment of a portable printer in accordance with the present disclosure;

FIG. **14** illustrates an inner frame of an embodiment of a portable printer in accordance with the present disclosure; and

FIG. **15** illustrates an embodiment of a dust cover assembly for a portable printer in accordance with the present disclosure.

DETAILED DESCRIPTION

Particular embodiments of the present disclosure are described hereinbelow with reference to the accompanying drawings; however, it is to be understood that the disclosed embodiments are merely exemplary of the disclosure, which may be embodied in various forms. Well-known and/or repetitive functions and constructions are not described in detail to avoid obscuring the present disclosure in unnecessary or redundant detail. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present disclosure in virtually any appropriately detailed structure. In addition, as used herein, terms referencing orientation, e.g., "top", "bottom", "up", "down", "left", "right", "clockwise", "counterclockwise", and the like, are used for illustrative purposes with reference to the figures and features shown therein. It is to be understood that embodiments in accordance with the present disclosure may be practiced in any orientation without limitation. In this description, as well as in the drawings, like-referenced numbers represent elements which may perform the same, similar, or equivalent functions.

With reference to FIGS. **1-4**, an embodiment of an asymmetrically-damped media centering mechanism **100** is shown. The disclosed mechanism **100** is adapted for use with a toothed drive belt **118** that is operably coupled to a first media support drive member **119** and a second media support drive member **125**. While a toothed drive belt is shown, any suitable belt or chain may be used (e.g., vee belt, round belt, flat belt, drive chain, etc.). As shown, first drive member **119** engages drive belt **118** within a notched region **124**. Second drive member **125** engages belt **118** within notched region **126**. It should be noted that any suitable manner of attachment may be utilized such that linear motion of drive members **119**, **125** is translated to/from drive belt **118**. The disclosed arrangement of drive belt **118**, first drive member **119**, and second drive member **125** provides for reciprocal linear movement of drive member **119** with respect to movement of drive member **125**. First drive member **119** and second drive member **125** may be slidably associated with one or more guides (not explicitly shown) that are configured to constrain the movement thereof to a substantially longitudinal axis of motion corresponding to the movement of belt **118**.

A pivot arm **110** that is rotatable around a pivot pin **115** is disposed on a support member **121**. Pivot arm **110** includes a first idler gear **113** and a driven gear **116** rotatably mounted thereupon adjacent to opposite ends **111** and **112**, respectively, of pivot arm **110**. First idler gear **113** and driven gear **116** are positioned on pivot arm **110** in essentially coplanar alignment with drive belt **118**. Drive belt **118** is disposed around idler gears **113** and **116** at one end of the mechanism **100**, and around a second idler gear **127** at an opposite end of mechanism **100**. As shown, drive belt **118** is continuous, however, drive belt **118** may be discontinuous or segmented.

A biasing member **128** is disposed between a free end **129** of drive member **119** and an anchor **130** and adapted to bias drive member **119** away from pivot arm **110**. Additionally or alternatively, a biasing member **128'** may be disposed between a free end **131** of drive member **125** and a corresponding anchor **130'**. Biasing member **128** and/or biasing member **128'** may include an extension spring. At rest, biasing member **128** causes drive member **119** to be drawn leftward, and drive member **125** to be drawn rightward, e.g., causes both drive members **119**, **125** to be drawn generally towards the center of centering mechanism **100**. A media support member (not explicitly shown) is associated with each of drive member **119**, **125** to retain a media roll therebetween, as described herein.

The disclosed media centering mechanism includes a damping gear **120** that is configured to engage driven gear **116**. With particular reference to FIG. **4**, damping gear **120** is associated with damping grease **122** that is applied between a movable surface **132** of damping gear **120** and a stationary surface, e.g., support member **121** and/or pin **123**. It is envisioned that any suitable damping grease, such as without limitation, SmartGrease™ Fluorocarbon Gel, manufactured by Nye Lubricants, Inc. of Fairhaven, Mass., United States, may be utilized. Damping grease **122** resists the rotational motion of damping gear **120**.

Referring again to FIG. **1**, during use, first drive member **119** and/or second drive member **125** may be caused to be moved in a direction indicated by the arrows, e.g., generally outwardly from the center of mechanism **100**, overcoming the biasing force of biasing member **128**, and causing belt **118** to traverse in a generally counterclockwise direction. The counterclockwise motion of belt **118** is translated through first idler gear **113** and/or driven gear **116** to cause a corresponding counterclockwise rotation of pivot arm **110**, which, in turn, causes driven gear **116** to disengage from damping gear **120**. In this manner, the outward linear motion of first drive member **119** and second drive member **125** is unimpeded by damping gear **120** thus enabling a user to freely open the media support members (not explicitly shown) associated therewith to facilitate the introduction of a media roll therebetween.

Continuing now with reference to FIG. **2**, the first drive member **119** and/or second drive member **125** may be caused to be moved in the opposite direction (generally inwardly towards the center of mechanism **100**) by, e.g., the biasing force of biasing member **128**. The described inward motion of first drive member **119** and second drive member **125**, in turn, causes belt **118** to traverse in a generally clockwise direction. The clockwise motion of belt **118** is translated through first idler gear **113** and/or driven gear **116** to cause a corresponding clockwise rotation of pivot arm **110**, which, in turn, engages driven gear **116** with damping gear **120**. The rotational resistance of damping gear **120** is translated through driven gear **116** to belt **118**, which slows the movement of first drive member **119** and second drive member **125**, and the media support members associated therewith. Thus, the dampening effect of engaged dampening gear **120** enables the return, or closing, of the first drive member **119** and second drive member **125**, and the media support members associated therewith, to be achieved in a smooth and controlled manner.

Other embodiments are contemplated wherein a second damping gear (not explicitly shown) may be employed to provide damping in a direction opposite to that provided by a first damping gear. In one arrangement, the second damping gear is arranged such that the pivot arm causes the second damping gear to engage one or more of the idler or driven gears mounted thereupon when the drive member(s) move in an opening direction.

Turning now to FIGS. **5** and **6**, an embodiment of a print media subassembly **200** having an asymmetrically damped media centering mechanism **201** is shown. Print media subassembly includes a housing **205** having defined therein a media storage well **250** that is dimensioned to accommodate a variety of roll-fed media. Housing **205** includes a support member **221** configured to support media centering mechanism **201** as described herein. Housing **205** includes one or more mounting bosses **251** configured to accept a fastener, pin, or other structural or connective element. The disclosed mechanism **201** includes a drive belt **218** that is operably coupled to a first media support drive member **219** and a second media support drive member **225**. While a toothed drive belt **218** is shown, any suitable belt or chain may be used as described herein. As shown, first drive member **219** engages drive belt **218** within a notched region **224**. Second drive member **225** engages belt **218** within notched region **226**. First and second drive members **219**, **225** include a retention tab **249** that is configured to retain belt **218** within notched region **224** and notched region **226**, respectively. It should be noted that any suitable manner of retention may be utilized such that linear motion of drive members **219**, **225** is translated to/from drive belt **218**.

Drive belt **218**, first drive member **219**, and second drive member **225** provide for reciprocal linear movement of drive member **219** with respect to movement of drive member **225**. First drive member **219** is slidably disposed within a slot **242** that is defined in support member **221** and includes a wide portion **244** and a narrow portion **243**. Second drive member **225** is slidably disposed within a slot **245** that is defined in support member **221** and includes a wide portion **247** and a narrow portion **246**. Slots **242** and **245** are configured to constrain the movement of drive members **219**, **225**, respectively, to a substantially longitudinal axis of motion corresponding generally to the movement of belt **218**. A positive stop **248** is disposed at an end of slot narrow portion **243** and/or slot narrow portion **246** and configured to limit the longitudinal travel of drive member **219** and/or drive member **225**, respectively.

A pivot arm **210** that is rotatable around a pivot pin **215** is disposed on a support member **221**. Pivot arm **210** includes a first idler roller **213** and a driven gear **216** rotatably mounted on pivot arm **210**. First idler roller **213** and driven gear **216** are positioned on pivot arm **210** in essentially coplanar alignment with drive belt **218**. Drive belt **218** is disposed around first idler roller **213** and driven gear **216** at one end of the mechanism **201**, and around a second idler roller **227** at an opposite end of mechanism **201**. As shown, drive belt **218** is continuous, however, drive belt **218** may be discontinuous or segmented.

An extension spring **228** is disposed between an anchor pin **230** provided on support member **221**, and a mounting tab **229** provided on drive member **219**. As can be readily appreciated, extension spring **228** is configured to bias drive member **219** away from pivot arm **210**, which, by operation of drive belt **218**, first idler roller **213**, driven gear **216**, and second idler roller **227**, serves to bias drive member **225** toward pivot arm **210** in a reciprocally synchronized manner. Biasing member **228** causes drive member **219** to be drawn leftward, and drive member **225** to be drawn rightward, e.g., causes both drive members **219**, **225** and media support members **240**, **241** respectively associated therewith to be drawn generally towards the center of storage well **250** to retain a roll of media therebetween.

First media support member **240** is operatively associated with drive member **219**, and second media support member **241** is operatively associated with drive member **225**. As shown, media support members **240**, **241** are joined to drive members **219**, **225**, respectively, by a fastener **252** which may include a threaded fastener, rivet, pin, or clip, however, any suitable manner or combination of attachment may be utilized, including without limitation, chemical bonding, adhesive, welding, and the like. Media support member **240**, **241** may be integrally formed with drive member **219**, **225**, respectively.

The disclosed media centering mechanism includes a damping gear **220** that is configured to engage with driven gear **216**. Damping gear **220** is associated with damping grease (not explicitly shown) that is applied between a movable surface of damping gear **220** and a stationary surface, e.g., support member **221** and/or pin **223** and adapted to resist the rotational motion of damping gear **220**. Any suitable damping grease (as previously described herein) may be utilized.

During use, a user loads a roll of media by opening one or both media support members **240**, **241**, inserting a roll of media (not explicitly shown) and releasing the media support members **240**, **241** which retain the media roll under tension provided by extension spring **228**. In greater detail, a user moves first media support member **240** and/or second media support member **241** generally outwardly from the center of mechanism **201**, thereby overcoming the biasing force of extension spring **228**, and causing belt **218** to traverse in a generally counterclockwise direction. The counterclockwise motion of belt **218** is translated through idler roller **213** and/or driven gear **216** to cause a corresponding counterclockwise rotation of pivot arm **210**, which, in turn, causes driven gear **216** to disengage from damping gear **220**. In this manner, the outward linear motion of first drive member **219** and second drive member **225** is unimpeded by damping gear **220** thus enabling a user to freely open media support members **240**, **241** associated therewith to facilitate the introduction of a media roll therebetween.

Continuing, a user may relax pressure on, or release completely, media support members **240**, **241** to allow first drive member **219** and/or second drive member **225** to move in the opposite direction, e.g., closing direction generally inwardly towards the center of mechanism **201** by e.g., the biasing force of extension spring **228**. The described inward motion of first drive member **219** and second drive member **225**, in turn, causes belt **218** to traverse in a generally clockwise direction. The clockwise motion of belt **218** is translated through first idler roller **213** and/or driven gear **216** to cause a corresponding clockwise rotation of pivot arm **210**, which, in turn, engages driven gear **216** with damping gear **220**. The rotational resistance of damping gear **220** is translated through driven gear **216** to belt **218**, which slows the movement of first drive member **219**, second drive member **225**, and the associated media support members **240**, **241**. Thus, the dampening effect of engaged dampening gear **220** enables the return, or closing, of media support members **240**, **241** to be achieved in a smooth and controlled manner.

With reference now to FIGS. **7** and **8**, an embodiment of an asymmetrically-damped media centering mechanism **300** employing a rack and pinion arrangement is shown. The disclosed media centering mechanism **300** includes a first media support member **340** and a second media support member **341**. The first and second media support members **340**, **341** are joined respectively to rack members **342**, **343** that extend inwardly towards the center of mechanism **300**. The media support members **340**, **341** may be joined to the respective rack member **342**, **343** by any suitable manner of attachment, including threaded fasteners, adhesive, welding, clips. Additionally or alternatively, media support members **340**, **341** may be integrally formed with the respective rack member **342**, **343** thereof.

Rack members **342**, **343** are reciprocally synchronized by pinion gear **314** that is axially coupled to driven gear **313**, such that pinion gear **314** and driven gear **313** rotate in tandem. Pinion gear **314** and driven gear **313** may be positively joined by a common shaft (not explicitly shown) and/or may be integrally formed. Media support members **340**, **341** are biased toward each other by an extension spring **328** that is fixed to media support members **340**, **341** by a retention clip **330**. The biasing force of extension spring **328** is sufficient to secure a media roll (not explicitly shown) between media support members **340**, **341**. Media support members **340**, **341** may include media hubs **344**, **345**, respectively, that are dimensioned to operatively engage an inner diameter (e.g., a core) of a media roll.

A damping gear **320** rotatably mounted on pin **323** is associated with damping grease **322** that is applied between a movable surface of damping gear **320** and an adjacent stationary surface (not explicitly shown) and/or pin **323**. Damping gear **320** is adapted to resist the rotational motion thereof by the viscous friction provided by damping grease **322**. As described elsewhere herein, any suitable damping grease may be utilized. In embodiments, additional or alternative friction-inducing elements may be employed in association with damping gear **320**, including without limitation magnetic elements, inertial elements (e.g., a flywheel), clockworks elements, clutch mechanisms, and the like.

Pinion gear **313** engages movable gear **316** that is rotatably mounted on a pivot arm **310** that is configured to pivot on an axis (not explicitly shown) such that, when media support members **340**, **341** are moved apart from each other (e.g., when loading a media roll), pivot arm **310** swings movable gear **316** away from damping gear **320**, thereby disengaging movable gear **316** and damping gear **320**. Conversely, when media support members **340**, **341** are moved toward from each other (e.g., when a media roll is grasped therebetween for use), pivot arm **310** swings movable gear **316** towards damping gear **320**, thereby engaging movable gear **316** and damping gear **320**. In an embodiment, the pivot axis of pivot arm **310** is coincident with the rotational axis of driven gear **313** and/or pinion gear **314**. The pivoting motion of pivot arm **310** may be induced by parasitic friction that may be present among and between driven gear **313**, pinion gear **314**, and/or pivot arm **310**, and associated components thereof. Thus, the dampening effect of engaged dampening gear **320** enables the return, or closing, of media support members **340**, **341** to be achieved in a smooth and controlled manner while permitting the opening of media support members **340**, **341** to be performed without any appreciable resistance apart from that provided by extension spring **328**.

Turning to FIGS. **9** and **10**, still another embodiment of an asymmetrical damping mechanism **400** in accordance with the present disclosure is shown wherein a damping roller **420** is disposed outside of a perimeter defined by drive belt **418**. Drive belt **418** is of a toothed type having a plurality of drive teeth **421** disposed on at least an outer surface **419** thereof. A pivoting arm assembly **410** is configured such that as the drive belt moves in a clockwise direction, e.g., a direction corresponding to the closing of a pair of media support members (not explicitly shown), the pivoting arm **410** rotates in a clockwise direction, causing the outer teeth **421** of drive belt **418** to engage damping roller **420**.

Turning to FIGS. **11** and **12**, an embodiment of a portable printer **500** in accordance with the present disclosure includes a control panel **523** having an overmolded bezel **520** associated therewith. The overmolded bezel **520** is formed from resilient material that may provide shock resistance and prevent the infiltration of contaminants into the control panel **523**, printer **500**, user interface element(s) **524**, and components associated therewith. The control panel **523** includes a display **522** that is adapted to present operational information to a user. By way of example, and without limitation, the display **522** may present status information, diagnostic information, setup information, and the like. Display **522** may include a text display, a graphical display, a monochrome display, a color display, and may include any display means now or in the future known, including without limitation a liquid crystal display (LCD), a light emitting diode (LED) display, an organic light emitting diode (OLED) display, a vacuum fluorescent display, and the like. Control panel **523** includes one or more user interface elements **524**, e.g., buttons and/or switches, adapted to accept user inputs. The overmolded bezel **520** may include the one or more user interface elements **524**, such that the resilient material of the bezel **520** provides a seal associated with the one or more user interface elements **524**.

Printer **500** includes a housing **540** having an upper housing **542** and a lower housing **544**. A media access door **510** is provided to facilitate the loading and unloading of media (not explicitly shown) in a media well **550**. As shown in FIG. **13**, media centering assembly **560** is positioned within media well **500**. Media centering assembly includes a pair of media support members **561** and an asymmetrically-damped centering mechanism **562** as described hereinabove. Printer **500** includes a belt clip **526** affixed to the lower housing **544** thereof. Belt clip **526** may be removably coupled to lower housing **544** by any suitable manner of attachment, such as without limitation threaded fasteners, one or more clips, and the like.

Printer **500** includes an upper inner frame **548**, as shown in FIG. **14**, and a lower inner frame **546**. The combination of upper inner frame **548** and lower inner frame **546** provides an inner support structure, which, in combination with upper housing **542** and lower housing **544**, forms a dual-wall housing assembly that provides increased impact resistance and rigidity. Latch lever **530** is operably associated with media cover **510** such that actuation of latch lever **530** disengages one or more latches (not explicitly shown) to permit media cover **510** to open. Media cover **510** is configured to be positioned in at least a first, closed position as shown in FIG. **11** and a second, open position as shown in FIG. **12**. Detents are provided in association with media cover **510** to retain media cover **510** in each of the open and closed positions. A spring (not explicitly shown) may be associated with media cover **510** and configured to bias media cover **510** toward an open position as shown in FIG. **12**. Upper inner frame **548** provides support for latch lever **530**. An opening **532** is defined in housing **540** to facilitate access to and actuation of latch lever **530**. A fingertip recess **531** is defined in latch lever **530** to enable the convenient actuation thereof by, e.g., the fingertip of a user. In this manner, media cover **510** may be unlatched using a single-handed motion to expose media storage well **550** for loading and loading media. A media roller **536** is operably associated with upper inner frame **548** to facilitate feeding of media along a print path.

Lower inner frame **546** includes a battery well **561** that is adapted to operably receive a battery pack **560**. Battery pack **560** may include one or more cells, which may be connected in series, in parallel, or in a combination of series and parallel, to provide operating power to printer **500**. Battery pack **560** may include a primary battery (e.g., non-rechargeable), a secondary battery (e.g., rechargeable), and or combinations thereof. Battery pack **560** may include an identifier, e.g., a physical, an electrical, or an optical identifier, that identifies to the printer **500** one or more characteristics of the battery pack **560**. Such characteristics may include, without limitation, a voltage, an amperage, an ampere-hour rating, a battery type (e.g., NiCd, NiMH, Li-ion), and a charge cycle count.

As shown in FIG. **15**, printer **500** includes dust cover assembly **570** that is dimensioned to cover one or more connectors (not explicitly shown). The dust cover assembly **570** may be formed from resilient material, e.g., silicone, neoprene, or other elastomeric material. The dust cover assembly includes a cap **571** that is joined to a base **574** by a resilient hinge or tethering member **575** that retains the cap **571** to the base **574**. The cap **571**, hinge member **575**, and base **574** may be integrally formed. Hinge member **575** may be a living hinge. The base **575** is retained to lower housing **544** by any suitable manner of fastening, including without limitation, threaded fasteners **572**, clips, tabs, and the like. Advantageously, the dust cover assembly may be user-replaceable, so that a worn or broken dust cover assembly **570** may be readily replaced with a new dust cover assembly **570**. In embodiments, a spare dust cover assembly **570** may be stored within a recess provided by the printer housing (not explicitly shown.)

The described embodiments of the present disclosure are intended to be illustrative rather than restrictive, and are not intended to represent every embodiment of the present disclosure. Further variations of the above-disclosed embodiments and other features and functions, or alternatives thereof, may be made or desirably combined into many other different systems or applications without departing from the spirit or scope of the disclosure as set forth in the following claims both literally and in equivalents recognized in law.

What is claimed is:

1. An asymmetrically-damped media centering mechanism, comprising

a first media support member moveable along a longitudinal axis thereof;

a second media support member moveable along a longitudinal axis thereof;

a reciprocal movement mechanism operably coupled to the first and second media support members, the reciprocal movement mechanism configured to translate a longitudinal movement of the first media support member into a corresponding opposite longitudinal movement of the second media support member;

a pivoting arm coupled to the reciprocal movement mechanism and pivotable between at least a first and a second position, wherein the pivoting arm pivots to the first position when the first and second media support members are moved closer to each other, and the pivoting arm pivots to the second position when the first and second media support members are moved further apart from each other; and

a damping gear configured to operably engage the reciprocal movement mechanism when the pivoting arm mechanism is in the first position and to disengage the reciprocal movement mechanism when the pivoting arm mechanism is in the second position.

2. An asymmetrically-damped media centering mechanism in accordance with claim **1**, wherein the pivoting arm includes a driven gear operatively coupled to the reciprocal movement mechanism.

3. An asymmetrically-damped media centering mechanism in accordance with claim **2**, wherein the driven gear engages the damping gear when the pivoting arm is in the first position.

4. An asymmetrically-damped media centering mechanism in accordance with claim **1**, wherein the damping gear includes damping grease.

5. An asymmetrically-damped media centering mechanism in accordance with claim **1**, further comprising a biasing member configured to bias the first and second media support members toward each other.

6. An asymmetrically-damped media centering mechanism in accordance with claim **5**, wherein the biasing member includes an extension spring.

7. An asymmetrically-damped media centering mechanism in accordance with claim **1**, wherein the reciprocal movement mechanism further comprises:

a first drive member operably coupled to the first media support member; and

a second drive member operably coupled to the second media support member.

8. An asymmetrically-damped media centering mechanism in accordance with claim **7**, further comprising a drive belt operably coupled to the first and second drive members and at least partially disposed around the driven gear.

9. An asymmetrically-damped media centering mechanism in accordance with claim **7**, wherein the first and second drive members include a notched region dimensioned to receive a drive belt.

10. An asymmetrically-damped media centering mechanism in accordance with claim **1**, wherein the reciprocal movement mechanism further comprises:

a first rack member operably coupled to the first media support member;

a second rack member operably coupled to the second media support member; and

a pinion gear operably engageable with the first and second rack members and configured to translate movement of the first rack member into a corresponding opposite movement of the second rack member.

11. An asymmetrically-damped media centering mechanism in accordance with claim **10**, wherein the pinion gear is axially coupled to the driven gear.

12. In a portable printer, a method of centering a media roll, comprising:

providing a first and a second media support member movable along a longitudinal axis and dimensioned to axially engage a media roll;

providing a reciprocal movement mechanism operably coupled to the first and second media support members wherein a longitudinal movement of one media support member causes a corresponding opposite longitudinal movement of the other media support member;

providing a pivoting arm operably coupled to the reciprocal movement mechanism, wherein the pivoting arm pivots to the first position when the media support members are moved closer to each other, and the pivoting arm pivots to the second position when the media support members are moved further apart from each other; and

providing a damping gear configured to engage the reciprocal movement mechanism when the pivoting arm is in the first position and to disengage the reciprocal movement mechanism when the pivoting arm is in the second position.

13. A method of centering a media roll in accordance with claim **12**, further comprising biasing the media support members toward each other.

14. A method of centering a media roll in accordance with claim **12**, wherein rotation of the damping gear is impeded by damping grease.

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